

The NEO Flux, Present and Past

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Interplanetary bodies which strike the Earth can be broadly classified into three main groups: 1) Earth-crossing asteroids, 2) long-period comets, and 3) periodic comets. Earth-crossing asteroids (ECAs), of which about 250 have been discovered, are now becoming fairly well explored. There are an estimated ~1500+/-500 ECAs larger than 1km in diameter. The population of ECAs smaller than 100m diameter is still a matter of debate.

About 700 long-period comets (LPCs) have been discovered, the majority of which were Earth-crossing. The population of LPCs and their collision rate with Earth, as a function of absolute magnitude, is fairly well understood. However, the relationship between absolute magnitude and the size of the nucleus is uncertain.

Periodic comets (PCs) (periods < 200 years) are the "stealth bombers" of the solar system. An estimated 95% of the periodic comets are "extinct" or asteroidal in appearance, and they are especially difficult to discover. A total of 26 active Earth-crossing periodic comets have been found; the active PCs represent only about 2% of the impact hazard. On the other hand, the population of extinct Earth-crossing PCs larger than 1km diameter is estimated to be of order 1500, about the same as that of the ECAs. To date only 25 extinct PCs have been discovered, however, and, of these, only a few are Earth-crossing. The large difference in discovery rate between extinct PCs and ECAs is due to the much longer periods of revolution of PCs and to the larger dispersion of their inclinations.

The contribution of the diverse NEOs to production of craters larger than 10km is estimated as follows:

Earth-crossing asteroids (av. $P = 2$ years)	60%
Periodic comets ($P = 4$ to 200 years) (95% extinct)	20%
Long period comets ($P > 200$ years)	20%

Large uncertainties attend the estimates for crater production by comet impact. On average, a 1km or larger NEO strikes the Earth about once per 100,000 years. The estimated rate of cratering is consistent with the geologic record of impact structures. Judging from the size distribution of small craters on the Moon, the cumulative number of impactors is approximately proportional to the inverse square of projectile diameter in the range from 100m to 1km. Below 100m, the frequency rises more steeply.